

Effect of Particulate Matter Air Pollution on Hospital Admissions and Medical Visits for Lung and Heart Disease in Two Southeast Idaho Cities

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Study Findings

- Same day exposures to PM10 were associated with increased RD admissions and medical visits for all age groups evaluated
- Increases in hospitalizations and medical visits ranged from 7.1% to 15.4% for every 50 µg/m³ increase in daily PM10 levels
- The RD findings were not likely to be due to chance
- Larger effects found in potentially susceptible groups (children and elderly)
- No strong evidence of confounding by co-pollutants
- MPC values were generally not sensitive to "small" changes in df for time and/or weather
- Little to no evidence was found of an association between daily PM10 exposures and CVD HA and medical visits
- Successful time-series analyses of air pollutants can be performed on smaller populations if centralized databases of hospital HA and diverse medical visits are available and integrate
- Results support the hypotheses that considering either HA or ER visits alone may underestimate the number of medical visits in relation to acute PM exposures and the overall public health impact

Study Question and Considerations

- How Do Short-Term Fluctuations in Daily PM Levels Relate to Changes in Daily Counts of Hospital Admissions or Other Medical Visits (Emergency Room, Urgent Care, and Family Practice)?
- Included All Patients with A Diagnosis of a Lung or Heart Disease Who Reside in or Near Chubbuck or Pocatello, Idaho
- Study Looked at Lung and/or Heart Diseases in Persons in All Age Groups and in Persons 0-17 Years, 18-64 Years and 65 Years and Older
- Conducted Control Variable Analyses for Health Outcomes not Related to Air Pollution (Certain Eye, GI, and Kidney Disorders and Total Trauma and Injury)

Study Population

- Total population: 53,871 (1990) to 61,166 (2000)
- Mostly white (92.94.1%)
- Non-white population mostly American Indian and of Hispanic origin
- 50-60% Mormon (LDS)
- Smoking prevalence about 18% (for Bannock County)
- A "case" if resident of Pocatello/Chubbuck as indicated by street address and was admitted to or visited one of the two hospitals, or hospital-related services
- No reference population needed for time-series

Comparison of PM Alone RD Results with Other Studies (MPC per 50 µg/m³)

Age Group	Mean Time-Series from MPC	MPC Results from GLM Studies	MPC Results from Non-GLM Studies
0-17	10.1	6.4-8.9	4.2-17.0
18-64	7.2	0.2-8.6	3.7-11.6
65+	13.7	-2.0-10.0	5.3-36.3
All Age	7.8	2.8-8.3	3.5-18.3
Combined 0-17/65+	10.0	NA	NA

Study Area



Major Sources of PM in Study Area

- FMC—produced elemental phosphorus from 1949-2001
- Simplon—produced phosphoric acid and various fertilizers from 1944-present
- FMC and Simplon are part of Eastern Micaul Flat Contamination Superfund site
- Other major sources include agricultural, road dust, and wood burning

Air Pollution Episodes in Study Area



Exposure and Other Data Collected

- PM Exposure Data
 - Collected PM Data from Four Monitoring Stations
 - Single Monitor Levels or Average of PM Levels Used to Determine Exposure Metric
 - Availability of Data An Important Factor in Determining Study Period
- Other Air Pollutants (NO₂ and SO₂)
- Weather Data (Temperature and Relative Humidity)
- Influenza Data

Air Pollution Study GLM Equation and MPC

- $\log(E(y)) = \beta_0 + \beta_1 \text{air pollutant}(s) + f_1(\text{df, time trend variables}) + f_2(\text{df, MinT, MaxT, and RH weather variables}) + \text{DOW} + \text{Flu}$
- f_1 and f_2 = natural splines
- MPC is the percent change in the mean number of HA/visits for a daily increase in PM10 levels
- $\text{MPC} = [\exp(\beta \times \text{PM10conc}) - 1] \times 100\%$

Step:

1. Smoothing for Time Effect

2. Specification of Weather

3. Add Day-of-Week and Flu Indicator Variable

4. Evaluate Lags

5. Test Sensitivity of β to df Changes in Time and Weather

6. Evaluate Co-Pollutants

